



**US Army Corps
of Engineers**
Rock Island District

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US Army Corps of Engineers - Rock Island District

UMR-IWW Navigation Study 1994 Public Meetings

Interim Product Report, November 1995

"Response to Issues Raised at the Public and NEPA Scoping Meetings of November 1994"

Issue Statements (Part 6 of 6)

ENGINEERING

67. What is the definition of small-scale measures, and what types of things are being examined?

Response: The small-scale measures defined as part of the UMR-IWW System Navigation Study are actually quite broad. They include a wide range of potential measures that do not involve major large-scale construction of new or expanded locking facilities or major alterations to the lock and dam structures. Originally, 92 small-scale measures were identified through meetings with industry and interest groups. These measures ranged from such things as improved scheduling of lock operations to approach improvements, allocation of costs through fees, assistance in lockages, and improved management of recreational vessel usage of locks. (See [Figure 2](#) at the end of this response for listing of the 92 original measures.)

These 92 measures were screened using four criteria which are applicable to the evaluation of all Corps of Engineers projects: completeness, effectiveness, efficiency, and acceptability. From these general guidelines, eight specific criteria were developed to assist in selecting the measures that meet the above guidelines. The eight criteria were used to identify measures that meet all of the following: (1) have a potential to reduce delays at locks, (2) are technically feasible, (3) are considered safe, (4) do not have disproportionately adverse environmental consequences, (5) are economically efficient, (6) are cost effective, (7) are not better pursued through industry cooperation rather than through Corps requirements, and (8) are not being addressed under the Corps of Engineers Operations and Maintenance Program.

Starting with 92 potential measures, this analysis yielded 17 that are deemed appropriate for further investigation. One of these measures, placing wicket gates in existing dams, was placed with large-scale measures because of cost. The remaining 16 measures can be grouped into seven general categories as follows:

(1) Optimizing decisions (scheduling program)

(2) Towboat power

- (a) Helper boats
- (b) Switch boats
- (c) Self help

(3) Tow haulage equipment

- (a) Powered traveling kevel
- (b) Endless cable
- (c) Extended guidewall

(4) Mooring facilities adjacent to lock approach

- (5) Crew elements
 - (a) Universal couplers/hand winches
 - (b) Standard training for crews
- (6) Tolls and reports
 - (a) Congestion tolls
 - (b) Excess lockage time charges
 - (c) Lockage time charges
 - (d) Publish lockage times
- (7) Recreational vessels
 - (a) Scheduling of recreational vessel usage
 - (b) Recreational craft landing above and below locks

The remaining measures will now be screened in more depth for the costs and impacts associated with the measure. The best measures resulting from the second screening will be incorporated into the systems analysis and plan formulation process which will lead to the selection of the recommended plan. (See Issues 57 and 68.)

Some small-scale measures examined requiring various improvements in new barge design. These measures included improved barge and boat hull designs, new barge and boat bottom treatments to reduce tow resistance and fuel consumption, and the development of universal couplers and hand winches to increase the time saving in breaking and remaking tows. The only measure that met the screening criteria and is being carried forward is the development of a simple, quick-operating, and universally adaptable coupler for joining barges that could save considerable time in breaking and remaking tows.

Comments:

- What is the difference between small- and large-scale measures? (1)
- Are any alternative barge designs being examined that would allow them to operate in a shallower channel? (1)
- Should focus on small-scale measures that reduce lockage times. Are measures that would reduce the time required to split and reconnect tows and require smaller crews being considered? (1)
- Look at ways to improve current shipping and improve barges without system expansion. (1)
- Happy to hear that small-scale improvements are being considered. (1)
- What non-structural measures are being examined to reduce costs? (2)
- Could better system management add to capacity by leveling out spring and fall peaks? (3)
- Can delays be relieved by improving the scheduling? (3)
- Will at least 15 percent of funds be spent on nonstructural measures? (1)

FIGURE 2 -- Potential Small-Scale Measures

68. The use of the river as a recreational resource is increasing the regularity at which both barges and recreational craft are waiting to use locks. Are measures being evaluated that would provide alternatives for recreational craft to using the main lock chambers?

Response: Of the original 92 small-scale measures evaluated, four were targeted at reducing conflicts between recreational boats and commercial vessels. Two of these measures are being carried forward for further evaluation to determine their ability to reduce lockage times. The two measures are scheduling of recreational vessel usage of the locks and providing recreational craft landings above and below the locks.

The scheduling of vessels would help to reduce the conflicts by providing certain times when recreational craft would be locked through. This would also help to maximize efficiency in that multiple recreation craft would be present at the same time to be locked through together. Landings above and below the locks would reduce the need for recreational boaters to use a lock in one pool and then lock through to the adjacent pool they want to use. These two measures, along with the other recommended ones, will be subject to an in-depth analysis to determine their delay reduction and economic potential.

The two eliminated options were recreational vessel bypass lifts and the licensing of recreational craft operators. The bypass lifts would have utilized a mechanical lifting device to transport vessels around the locks. This option was eliminated due to its cost and economic inefficiency. The licensing option, which would provide for additional training for recreational craft operators, was eliminated because it would not contribute significantly to reductions in delays. (See Issue 36 on recreation conflicts and Issue 67 on small-scale measures.)

Comments:

- Are locks for pleasure craft being examined? (1)
- Are small-scale measures to assist recreational craft being examined? (1)
- Is consideration being given to the increasing demands recreation is placing on the lock system? (5)

69. Many of the locks and dams on the Upper Mississippi River and Illinois Waterway were constructed in the 1930-40s. Is the study addressing the need for improvements or replacement of any of these locks and dams?

Response: The condition of the existing dams, many of which were constructed in the 1930s and 1940s, is being evaluated as part of the future without-project condition. The lock and dam system as a whole is generally in good condition. The Corps of Engineers ongoing maintenance activities and active major rehabilitation program help to maintain these facilities. Approximately \$600 million has been spent on the 37 lock and dam sites of the Upper Mississippi River and Illinois Waterway over the last 15 years. The system is expected to perform satisfactorily over the next 50 years given continued maintenance and periodic major rehabilitation. The study will determine the investment needs to maintain the system to an acceptable level of performance during this period.

The Navigation Study is not looking at the construction of additional dams, replacing two dams with one, or hydropower facilities. Non-Federal interests are pursuing hydropower opportunities at some sites on the system.

Comments:

- Is building additional dams being considered? (1)
- Is considering replacing two dams with one part of the study? (4)
- What condition are the existing dams in and will any need improvements? (5)
- Is consideration being given to fitting dams with hydropower capabilities? (1)

70. Are options involving widening, deepening, or straightening the channel being considered as part of this study?

Response: The Corps of Engineers has no plans to widen, deepen, or straighten the existing navigation channel on the Upper Mississippi River or Illinois Waterway. The types of improvements being examined in the study are limited to small- and large-scale measures at the lock and dam sites which would relieve traffic congestion at lock sites. The exception would be any channel modifications which may be deemed necessary in the immediate vicinity of a lock facility.

The reliability of the existing 9-foot channel is being evaluated over the study's 50-year planning horizon. The Engineering Work Group as part of its study of Future Operations and Maintenance Costs is estimating the costs associated with keeping the 9-foot channel operational over the study period regardless of whether any improvements are made to the locks. Their qualitative assessment will take into account such impacts as future dredged material placement practices, the impacts of any new environmental laws on maintaining the 9-foot channel, and incremental increases in traffic.

Comments:

- Is widening and deepening the channel being considered? (13)
- Is a 12-foot channel being considered? (4)
- What effects will widening the channel have on fish and wildlife? (1)
- Corps should consider straightening sharp corners for safety. (1)
- When will Corps straighten curves? (1)
- Is limitations of the channel, narrowness caused by sedimentation, being examined as a potential limiting factor to traffic increases? (1)
- Will the study address the need for dredging for recreational boaters? (1)

71. The large-scale measures under consideration are focused on the construction of new locks or the expansion of existing ones. Are auxiliary lock chambers being examined as potential sites for constructing either a new 600- or 1,200-foot lock?

Response: The auxiliary gate bays were originally constructed as potential sites for the eventual construction of new locks and for emergency passage in the event of main chamber closure to allow the Corps of Engineers maintenance fleet to pass. Only six lock sites on the UMR-IWW system have operational auxiliary lock sites. The auxiliary gate bay is one of six general locations being evaluated as potential sites for expanding or adding 600- or 1,200-foot locks at each of the 16 lock sites being evaluated for large-scale measures. The sites under consideration include Locks and Dams 11 to 25 on the Upper Mississippi River and Peoria and La Grange on the Illinois Waterway. They have been identified as the sites that will experience the most congestion during the 50-year planning horizon. The specific locations being evaluated at each site are shown in Figure 3 and include:

- Location 1 - Landward of the existing lock
- Location 2 - Extension of the existing lock
- Location 3 - At the existing auxiliary gate/lock
- Location 4 - Along the gated section of the dam
- Location 5 - Along the spillway/overflow section of the dam
- Location 6 - On the opposite shore from the existing lock

FIGURE 3

The study team has completed the initial evaluation of the six alternative sites. Location 1 was eliminated at all lock sites except at Locks and Dams 14, 17, 20, 25, Peoria, and La Grange. Locations 2, 3, and 4 were the most favored due to minimal environmental and navigation impacts. Locations 5 and 6 were eliminated from consideration at all sites due to high environmental impacts, costs to relocate the navigation channel, and impacts to the existing lock approaches. The remaining location options will be carried forward and evaluated in greater detail in Phase II of the site evaluation process. Following the second screening, the remaining measures will be incorporated into the systems analysis and used in the plan formulation process.

Comments:

- What are the auxiliary locks for and why aren't they used? (1)
- Is the study looking at using auxiliary lock sites to relieve traffic congestion? (2)

72. The Navigation Study should examine innovative lock construction and design techniques which reduce costs and decrease environmental impacts.

Response: Sixteen lock and dam sites on the UMR-IWW system are being considered in this study for large-scale enhancements to improve navigation. The main focus of the large-scale enhancement study will be to provide feasibility and cost information for economic comparisons during the plan formulation process. As part of this evaluation, three types of lock construction are being considered. A Type B lock involves innovative construction methods and can be constructed for a lower initial cost than a traditional lock (Lock Type A). However, the Type C lock is the least first cost alternative.

Traditional locks (Type A) are constructed on site. To construct a Type A lock, large steel cofferdams filled with dredged sand and capped with crushed rock are constructed around the lock site. The water inside the cofferdam is pumped out, and lock construction takes place inside the cofferdam. The Type A or traditional design lock has the highest expected performance, longest life, and lowest construction risks.

Construction of Type B or C locks can be done "in the wet" (with minimal use of cofferdams) due to the type of construction techniques employed. For a Type B lock, construction would employ float-in, precast-concrete lock and guidewall sections and expanded use of sheet pile cells. This type of construction has been proven in marine construction, but has seldom been used on inland rivers. A Type C lock would be constructed primarily of sheetpile cells. These alternative lock designs increase construction risks and have somewhat lower lock performance (e.g., shorter service life and reliability). However, by avoiding the need to build a large cofferdam, the costs and the amount of natural resources used in construction (steel, fuel, etc.) can be reduced. This lowers impacts to the environment by greatly decreasing the amount of dredged sand and rock required to fill the dams and reduces the amount of dredged sand, rock disposal, and placement sites required after projection completion. In addition, Type A lock construction requires more labor and equipment resources than alternate construction techniques.

The environmental benefits of Lock Types B and C are derived from the fact that they are largely constructed "in the wet," requiring a shorter construction period and involving only minimal cofferdam construction. In addition, constructing locks in the wet can decrease construction times. The benefits of decreased lock construction time are then passed on to the environment in terms of reduced exposure to construction related impacts. In addition, if Type B or C lock construction techniques are selected, there will be less construction associated noise and air pollution.

Innovative designs also are being evaluated that would place the filling and emptying systems in the floor of the lock, instead of in the lock walls. This would reduce the required thickness of walls and thereby lower costs. The innovative filling and emptying systems will primarily be examined for use with Type B locks.

Comments:

- How are environmental concerns being incorporated into the engineering efforts? (2)
- We recommend that the plan clearly present engineering guidelines for the construction, operation and maintenance of a system which will assure the viability of both commercial navigation and the large river floodplain ecosystem, supporting fish and wildlife habitat. (1)
- Will new navigation structures be designed to minimize their impact on habitat and will opportunities be sought to design them to improve habitat? (1)
- Is there an opportunity for cellular-type construction technology to construct new locks? (1)
- Innovative design ideas are a good strategy. (1)

73. In considering large-scale measures, what sill depth is being evaluated for new locks?

Response: The depth of the sill proposed varies with the type of lock construction. For the traditional lock design, Type A, sill elevations are set at twice the authorized draft (in this case 18 feet twice the 9-foot channel depth). For the innovative lock designs, Types B and C, a shallower 15.3-foot sill depth is being evaluated. The depth below 9 feet is necessary to allow for the displacement of water as a tow enters the chamber and is not related to planning for any alterations to the channel depth. When tows enter a lock, a large volume of water is displaced across the opening at the sill. The additional depth provides safe entrance to the lock and improves the overall locking efficiency.

Comment:

- What is the proposed sill depth of new locks? (1)

74. What is the role of levees in maintaining the navigation system and what potential impacts and costs are expected if improvements are made?

Response: Flood control levees were not constructed as part of the 9-foot channel navigation project. However, at lock and dam sites, the pool is maintained by Federal structures which tie into high ground. "High ground" may be a natural or man-made land feature, such as a levee. During the establishment of the 9-foot channel navigation project, each location was evaluated and structures necessary to maintain the navigation pools were constructed. These structures are maintained by the Corps of Engineers. As a result, the costs associated with maintaining levees that are not a part of the system will not be considered as part of this study.

The UMR-IWW System Navigation Study's bank erosion study is examining the relationship between incremental increases in navigation and bank erosion. While this study will be considering some sites where levees run parallel to the bankline, it is not focusing on impacts to levees.

In March of 1995, the Rock Island District, U.S. Army Corps of Engineers completed a separate reconnaissance report on shoreline erosion which evaluated 35 erosion sites. The study specifically examined eight levee and drainage districts along the Upper Mississippi River in Iowa, Illinois, and Missouri to assess the impacts of erosion and risks of failure. As a result of technical, economic, and environmental analyses, and lacking authority or allocation to assist the levee and drainage districts in repairing eroded shoreline along the Mississippi River, the Rock Island District Engineer recommended that the study be placed in an "inactive status." (See Issue 9 on impacts of Flood of 1993 on study.)

Comments:

- Will increased navigation traffic affect leveed areas? (1)
- Are impacts to levees being considered? (1)
- Are the costs of operating levees included in cost benefit? (1)

75. Significant study resources are going into the development of various models to assist in evaluating alternative measures. Is the Corps of Engineers satisfied with the results being obtained?

Response: The use of navigation models is a valuable tool in evaluating the feasibility and impacts associated with a number of alternatives. Three types of modeling efforts are being done as part of the engineering efforts: physical modeling of Locks and Dams 22 and 25, filling and emptying systems, and numerical modeling. The models help to determine how the construction of various measures would impact water velocities, current patterns, navigation conditions, and safety. This information is very useful in evaluating and understanding the potential of various options as well as assisting in identifying the related impacts. The models of Locks and Dams 22 (rock foundation) and Lock 25 (pile foundation) were constructed as representative sites of the Upper Mississippi River. In addition, modeling of innovative lock designs with alternative filling and emptying systems is being undertaken to identify cost saving measures. Numerical modeling allows the evaluation of sites without the need for a physical model. These modeling efforts are providing valuable data and information that will assist the study team in selecting a recommended plan.

Comment:

- Is Corps satisfied with results being obtained from models of new lock and dam structures and their accuracy? (1)

76. As part of the study plan, the Corps of Engineers has indicated that site-specific engineering will begin before the official end of the feasibility study phase. The reasons for this should be clearly explained.

Response: The Corps of Engineers typically would conclude the feasibility phase and wait for congressional authorization before detailed site-specific work would be carried out. However, the reconnaissance studies indicated that the optimum timing for implementing improvements could be as early as the year 2001 for Locks 20 to 25. The feasibility study will make the final determination on timing. However, if detailed site-specific work waits for congressional authorization prior to starting, construction could not commence until the year 2007 at the earliest. Therefore, in its March 1, 1993, guidance, Headquarters U.S. Army Corps of Engineers directed that site-specific feasibility studies be accomplished at a time when the system feasibility studies are sufficiently complete to support the timing, size, and justification for the first improvement if one is recommended. This site-specific work will be initiated subsequent to identifying the recommended plan if it involves navigation improvement.

Comment:

- Isn't it backwards to be doing the site-specific engineering analysis before the study is done to show if expansions are necessary? (1)

[Figure 2 - Potential Small-Scale Measures](#)

[Figure 3 - Alternative New Lock Locations at a Typical Lock and Dam Site](#)

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